

# Evidence-Based Palliative Care in the Intensive Care Unit: A Systematic Review of Interventions

Rebecca Aslakson, MD, PhD,<sup>1</sup> Jennifer Cheng, MD,<sup>2</sup> Daniela Vollenweider, MD,<sup>3</sup>  
Dragos Galusca, MD,<sup>1</sup> Thomas J. Smith, MD,<sup>4</sup> and Peter J. Pronovost, MD, PhD<sup>1</sup>

## Abstract

**Background:** Over the last 20 years, multiple interventions to better integrate palliative care and intensive care unit (ICU) care have been evaluated. This systematic review summarizes these studies and their outcomes.

**Methods:** We searched MEDLINE, Embase, Cumulative Index to Nursing and Allied Health Literature (CINAHL), the Cochrane Library, and the Web of Science; performed a search of articles published by opinion leaders in the field; and reviewed hand-search articles as of August 13, 2012. The terms “palliative care” and “intensive care unit” were mapped to MeSH subject headings and “exploded.” We included trials of adult patients that evaluated an ICU intervention and addressed Robert Wood Johnson group-identified domains of high-quality end-of-life care in the ICU. We excluded case series, editorials, and review articles. We compared two types of interventions, integrative and consultative, focusing on the outcomes of patient and family satisfaction, mortality, and ICU and hospital length of stay (LOS), because these were most prevalent among studies.

**Results:** Our search strategy yielded 3328 references, of which we included 37 publications detailing 30 unique interventions. Interventions and outcome measures were heterogeneous, and many studies were underpowered and/or subject to multiple biases. Most of the interventions resulted in a decrease in hospital and ICU LOS. Few interventions significantly affected satisfaction. With one exception, the interventions decreased or had no effect on mortality. There was no evidence of harm from any intervention.

**Conclusions:** Heterogeneity of interventions made comparison of ICU-based palliative care interventions difficult. However, existing evidence suggests proactive palliative care in the ICU, using either consultative or integrative palliative care interventions, decrease hospital and ICU LOS, do not affect satisfaction, and either decrease or do not affect mortality.

## Introduction

**T**WENTY PERCENT OF PEOPLE in the United States die either in an intensive care unit (ICU) or shortly after ICU admission.<sup>1</sup> Although the use of hospice at the time of death has increased over the last decade, so also has the use of ICU services in the last month of life.<sup>2</sup> Thus, ICUs are critically important locations for providing effective, high-quality end-of-life and palliative care.

Patients in an ICU have a high symptom burden and frequently experience functional impairments both in the ICU and after discharge. Evidence shows that patients experience difficulty communicating, pain, dyspnea, hunger,

and drowsiness while in the ICU.<sup>3–5</sup> Following ICU discharge, these patients often have poor health-related quality of life with significant functional limitations and higher mortality.<sup>6–9</sup> The term “post-intensive care syndrome” refers to a constellation of impairments in both ICU survivors and their family members including persistent physical, cognitive, and psychological impairments in survivors and psychological impairments in family members of ICU patients.<sup>10</sup> Thus, providing effective and high-quality palliative care to improve end-of-life care and to better mitigate short- and long-term physical and psychological burdens and functional impairments has the potential to benefit all ICU patients and their families.

<sup>1</sup>Department of Anesthesiology and Critical Care Medicine, <sup>2</sup>Department of Palliative Medicine, <sup>4</sup>Department of Oncology and Palliative Care Program, The Johns Hopkins School of Medicine, Baltimore, Maryland.

<sup>3</sup>Department of Medicine, Division of General Internal Medicine, Johns Hopkins University, Baltimore, Maryland.

Accepted October 7, 2013.

The literature includes several consensus statements and professional society clinical guidelines recommending ways to improve the delivery of palliative care in the ICU.<sup>10–17</sup> Included in these guidelines are recommendations for patient- and family-centered care and shared decision making. A consensus group, funded by the Robert Wood Johnson Foundation, included seven domains for equality care in the ICU<sup>15</sup> and these include: (1) patient- and family-centered decision making, (2) communication, (3) continuity of care, (4) emotional and practical support of patients and families, (5) symptom management and comfort care, (6) spiritual support, and (7) emotional and organizational support for ICU clinicians. Of note, all of these domains are inherent to palliative care and are likely to benefit both dying and surviving ICU patients and their families.

Interventions to improve palliative medicine in the ICU have been evaluated by two recent literature reviews. The first was a systematic review by Scheuneman and colleagues, which included a search of the literature from 1995 to 2010 using MEDLINE, PsychInfo, Cochrane, and Cumulative Index to Nursing and Allied Health Literature (CINAHL) databases.<sup>18</sup> However, the search included only communication-related interventions. The second review was conducted by the Improving Palliative Care in the ICU (IPAL-ICU) consensus group.<sup>19</sup> This review was not systematic and included only the MEDLINE database. The IPAL-ICU group suggested that the type of palliative care intervention—integrated into standard ICU care, consultative to that care, or a combination of both—might impact efficacy.<sup>19</sup> To capture articles published prior to 1995, to include interventions that involve palliative medicine related concepts beyond communication, to search a wider breadth of databases, and to contrast the efficacy of consultative versus integrative interventions, we conducted a systematic review of the literature to identify evidence-based interventions that improve the delivery of palliative care in the adult ICU. To more clearly interpret the data, we further defined “integrative” and “consultative” into two mutually exclusive categories and thus eliminated designation of an intervention as “both.”

## Methods

### *The systematic review*

We conducted a systematic review of the literature to identify evidence-based interventions that improve the delivery of palliative care in the adult ICU. We searched MEDLINE (1949–2011), Embase (1974–2011), CINAHL (1982–2011), the Cochrane Library (2005–2011), and the Web of Science (1956–2011) as of August 13, 2012. A detailed and systematic search strategy was used, with the terms “palliative care” and “intensive care unit” mapped to the appropriate MeSH subject headings and “exploded” (see Appendix 1 for specific search terms). We did not limit by language or publication type. As MeSH terms for palliative care are relatively immature, we also completed an ancillary search where articles published by 15 prominent researchers and thought leaders in the field of palliative care in the ICU (see Appendix 2) were identified and reviewed. In addition, we hand searched both personal files and the reference lists of review articles, consensus guidelines, professional society statements, and articles included in the final review.

### *Study selection*

Exclusion criteria were (1) case series, (2) commentary or editorial, (3) review article, (4) lack of measurements or lack of novel data, (5) fewer than 20 patients enrolled in the study, and (6) publication only as abstract or nonpeer reviewed dissertation.

Inclusion criteria were (1) study of adults (age 18 or over), (2) study must involve evaluation of an intervention, and (3) intervention must involve both ICU patients and any of the seven domains identified by the Robert Wood Johnson consensus panel. For each eligible study, two authors (JC, DV, DG, and/or RA) used standardized abstraction sheets, and discrepancies were resolved by discussion between abstractors. Abstracted evidence was graded for the strength of the best available evidence, including the risk of bias in relevant studies, using a system based on the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) Working Group criteria adopted by the Agency for Healthcare Research and Quality (AHRQ).<sup>20,21</sup>

### *Categorization of study*

We placed each study intervention into one of two categories, integrative or consultative. These categories were first generally described by the Improving Palliative Care in the ICU (IPAL-ICU) team.<sup>19</sup> Because the field lacks formal definitions of integrative and consultative palliative care, we developed the following definitions. “Consultative” described an intervention that enabled a non-ICU person—one who would not otherwise be involved in ICU patient care—to interact with the patient and/or patient family. “Integrative” described an intervention that only had ICU personnel interacting with patients and families. Interventions involving palliative care or ethics consults were classified as consultative. Interventions were classified as integrative that involved (1) a non-ICU clinician teaching ICU personnel how to better provide palliative care, (2) an order set or standardized pamphlet for families, and/or (3) standardization or triggering of ICU family meetings. For clarity, we made these definitions mutually exclusive, thus avoiding the concept of a “mixed intervention.” We carefully read each study, including the discussion section, to determine which category most closely represented the study purpose and design.

## Results

Our search strategy yielded 3328 references (see Fig. 1). Deletion of duplicates and screening of titles recovered 1746 references. Further abstract screening yielded 144 articles. Full review of complete articles yielded 33 studies. Our ancillary search strategies recovered 45 articles for full review and 4 articles for final inclusion. In total, 37 publications met our inclusion and exclusion criteria (see Table 2).<sup>22–58</sup> Some interventions were evaluated multiple times in multiple single- or multicenter studies yielding multiple publications.<sup>22,24,28,29,34,35,45,49,50,54</sup> One study of one intervention yielded multiple publications.<sup>39–41</sup> One publication<sup>24</sup> contrasted two different interventions—one consultative and the other integrative—against a single control; for this review, the two interventions were divided and analyzed separately. Thus, though there were 37 publications, there were 36 interventions to analyze.

TABLE 1. STUDIES INCLUDED IN SYSTEMATIC REVIEW

Study	Intervention	Study description ( <i>n</i> = # patients, unless specified otherwise)	Population	Outcomes	
				Significant	Nonsignificant
Carlson, et al., 1988 <sup>22</sup>	Referral to comprehensive support care team & discharge from MICU	<i>n</i> = 93; before-and-after, single center	MICU	Reduce hospital LOS (33 days to 10 days; <i>p</i> < 0.05) Reduce hospital charges (\$36,200 to \$13,200; <i>p</i> < 0.05)	MICU LOS; mortality
Field, et al., 1989 <sup>23</sup>	Referral to comprehensive support care team & discharge from MICU	<i>n</i> = 40; before-and-after, single center	MICU	Reduce ICU LOS (12 days to 6 days; <i>p</i> < 0.01) Reduce TISS scores ( <i>p</i> < 0.01)	Hospital LOS; mortality
Daly, et al., 1994 <sup>24</sup>	Intervention #1: Information booklet given out to families	<i>n</i> = 40; before-and-after, single center	SICU	None	CCFNI; State-Trait Anxiety Scale
Daly, et al., 1994 <sup>24</sup>	Intervention #2: Information booklet given out to families & family meeting convened	<i>n</i> = 40; before-and-after, single center	SICU	None	CCFNI; State-Trait Anxiety Scale
Holloran, et al., 1995 <sup>25</sup>	Education about ethics and end-of-life care for surgical house staff during ICU rotations	Unknown <i>n</i> ; before-and-after, single center	SICU	Reduced ICU LOS by 46% ( <i>p</i> < 0.05) Reduced decedent hospital LOS ( <i>p</i> < 0.05) Increased advance directive documentation ( <i>p</i> < 0.05)	None
Dowdy, et al., 1998 <sup>26</sup>	Ethics consult	<i>n</i> = 99; before-and-after, single center	Unspecified	Reduced ICU LOS ( <i>p</i> < 0.01) Increased mortality (68% vs. 43%; <i>p</i> < 0.05) Increased DNR ( <i>p</i> < 0.05) and WOLS ( <i>p</i> < 0.05) orders Decedent communication quality ( <i>p</i> < 0.01)	Survivor communication quality; cost of care
Medland, et al., 1998 <sup>27</sup>	Intensive communication: nurse-led conversation with family accompanied by informational booklet and daily phone calls from nurse to family	<i>n</i> = 30; before-and-after, single center	MICU	Decreased family phone calls to ICU nurse (3.26 to 0.33 calls/day; <i>p</i> < 0.0001)	Satisfaction with overall care; assessment of information

(continued)

TABLE 1. (CONTINUED)

Study	Intervention	Study description ( <i>n</i> =# patients, unless specified otherwise)	Population	Outcomes	
				Significant	Non-significant
Lilly, et al., 2000 <sup>28</sup>	Intensive communication: multidisciplinary family meeting within 72hrs of admission	<i>n</i> = 530; before-and-after, single center	MICU	Reduced nonconsensus days between ICU clinicians (65 days to 4 days/1000 pt-days) Reduced nonconsensus days between ICU clinicians and families (171 days to 16 days per 1000 pt-days) Decreased LOS (4 days vs. 3 days for all patients, <i>p</i> = 0.01; 5 days vs. 3 days for highest APACHE score patients, <i>p</i> = 0.02) Decreased mortality (46% to 34%; <i>p</i> = 0.02)	None
Schneiderman, et al., 2000 <sup>29</sup>	Ethics consult	<i>n</i> = 74; prospective RCT, single center	MICU & PICU	Reduced decedent ICU LOS (13.2 days vs. 4.2 days; <i>p</i> = 0.03) Fewer artificial nutrition-hydration days (12.0 days vs. 4.1 days; <i>p</i> = 0.05) Fewer ventilator days (11.4 days vs. 3.7 days; <i>p</i> = 0.05)	Mortality; % patients choosing DNR; among all patients: transfusions, trach, ventilator, or artificial nutrition/hydration days
Azoulay, et al., 2002 <sup>30</sup>	Informational brochure for families. Brochure contained names of ICU physicians, contact information for primary ICU nurse and physician, diagram of a typical ICU room, and a glossary of 12 common ICU terms.	<i>n</i> = 175; prospective blinded RCT, multicenter	Unspecified	Improved overall comprehension (11.5% to 40.9%; <i>p</i> < 0.0001)	CCFNI; comprehension of prognosis; mortality
Ahrens, et al., 2003 <sup>31</sup>	Intensive communication: specialized APNs and single ICU physician care for intervention patients	<i>n</i> = 151; prospective, cohort trial single center	MICU	Reduced ICU LOS (9.5 days to 6.1 days; <i>p</i> = 0.009) Reduced hospital LOS (16.4 days to 11.3 days; <i>p</i> = 0.03) Reduced direct and indirect charges per case (\$24,080 to \$15,559; <i>p</i> = 0.01 and \$8,035 to \$5,087; <i>p</i> = 0.007, respectively)	Mortality

(continued)

TABLE 1. (CONTINUED)

Study	Intervention	Study description ( <i>n</i> =# patients, unless specified otherwise)	Population	Outcomes	
				Significant	Nonsignificant
Burns, et al., 2003 <sup>32</sup>	Intensive communication: ICU social worker regularly meets with family members	<i>n</i> = 873; before-and-after, single center	MICU & SICU	Increased DNR orders (OR 1.81, <i>p</i> = 0.017) Increased “comfort care” orders (OR 1.94; <i>p</i> = 0.018) Increased orders choosing “aggressive care” (OR 2.30; <i>p</i> = 0.002)	Satisfaction
Campbell, et al., 2003 <sup>33</sup>	PC consult	<i>n</i> = 81; before-and-after, single center	MICU	Among cerebral ischemia ICU patients: Reduced ICU LOS (7.1 days to 3.7 days; <i>p</i> < 0.01) Reduced hospital LOS (8.6 days to 4.7 days; <i>p</i> < 0.001)	Among MSOF patients: ICU and hospital LOS
Lilly, et al., 2003 <sup>34</sup>	Intensive communication: multidisciplinary family meeting within 72 hrs of admission	<i>n</i> = 2495; before-and-after, single center	MICU	Reduced ICU LOS (4 days to 3 days; <i>p</i> = 0.01); Reduced mortality (31% vs. 18%; <i>p</i> < 0.001)	None
Schneiderman, et al., 2003 <sup>35</sup>	Ethics consult	<i>n</i> = 551; prospective RCT; multicenter	Unspecified	Among decedents: Reduced ICU LOS (1.44 days; <i>p</i> = 0.03) Reduced hospital LOS (2.95 days; <i>p</i> = 0.01) Reduced ventilation days (1.7 days; <i>p</i> = 0.03)	Mortality, artificial nutrition/hydration days
Campbell, et al., 2004 <sup>36</sup>	PC consult	<i>n</i> = 52; before-and-after, single center	MICU	Reduced ICU LOS (6.8 days to 3.5 days; <i>p</i> < 0.004) Reduced hospital LOS (12.1 days to 7.4 days; <i>p</i> < 0.007) Fewer interventions for DNR patients (TISS 16.89 to 8.65; <i>p</i> < 0.01)	Mortality; discharge to nursing home vs. home
Hall, et al., 2004 <sup>37</sup>	Clinician education via monthly meetings & PC order set	<i>n</i> = 306; before-and-after, single center	Mixed medical- surgical	Reduced hospital LOS (16.4 days to 10.5 days; <i>p</i> < 0.005) Increased pastoral care involvement (7.2% to 71.4%; <i>p</i> < 0.05).	ICU LOS; mechanical ventilation duration; treatments (pressors, nutrition) avoided
Treace, et al., 2004 <sup>38</sup>	WOLS order set	<i>n</i> = 117; ( <i>n</i> = 204 clinicians) before-and-after; single center	Unspecified	None	ICU and hospital LOS; nursing QODD

(continued)

TABLE 1. (CONTINUED)

Study	Intervention	Study description (n=# patients, unless specified otherwise)	Population	Outcomes	
				Significant	Non-significant
Critical Care Family Assistance Program, 2005 <sup>30-41</sup>	Needs assessment & individualized plan to improve communication, environment, & educational materials in ICUs	n = 563 family members; before-and-after, multicenter	Unspecified	Quality of social worker communication (p=0.05)	Quality of communication from nursing, physician, pastoral care, respiratory care, or dietary teams; Quality of care; family satisfaction with treatment and care
Lautrette, et al., 2007 <sup>42</sup>	Brochure, clinician education, & intensive communication: VALUE format to family meetings	n = 126; prospective RCT, multicenter	MICU, SICU, & mixed medical-surgical	Reduced family member IES (p=0.02) Reduced family PTSD prevalence (69% to 45%; p=0.01) Reduced family HADS (p=0.004)	ICU LOS; mortality
Norton, et al., 2007 <sup>43</sup>	PC consult	n = 191; before-and-after, single center	MICU	Reduced ICU LOS (16.28 days vs. 8.96 days; p=0.001).	Hospital LOS; mortality
Steel, et al., 2008 <sup>44</sup>	Intensive communication: weekly relative's clinic with ICU physician and nurse	n = 321; before-and-after, single center	Unspecified	None	Family Satisfaction (Critical Care Family Satisfaction Survey)
Curtis, et al., 2008 <sup>45</sup>	Clinician education, local champions, feedback to clinicians, & order sets	n = 590; before-and-after, single center	Unspecified	Increased nurse QODD score (63.1 to 67.1; p=0.01) Reduced ICU LOS (3.86 days to 2.9 days; p=0.03) Reduced hospital LOS (5 days to 4 days, p=0.02)	Family QODD FS-ICU
Kaufert, et al., 2008 <sup>46</sup>	PC consult—"family support team consult"	n = 88 family members; before-and-after, single center	MICU	Family Satisfaction with Care survey: Satisfaction with hospital experience (p<0.05) Satisfaction with decision making process (p<0.05)	Family Satisfaction with Care: Overall satisfaction with amount of health care
Mosenthal, et al., 2008 <sup>47</sup>	PC consult	n = 653; before-and-after, single center	Trauma ICU	Unclear: no p-values reported Increased goals-of-care discussion on rounds Among decedents: Reduced ICU and hospital LOS	Mortality; DNR rates; WOLS rates

(continued)

TABLE 1. (CONTINUED)

Study	Intervention	Study description (n=# patients, unless specified otherwise)	Population	Outcomes	
				Significant	Nonsignificant
Bradley, et al., 2009 <sup>48</sup>	Trigger system: SICU physicians notified by trained medical student that patient appropriate for PC consult	n = 644; before-and-after, single center	SICU	None	Palliative care consultation rate (though 76% of patients who triggered a notification did not receive a palliative care consult)
Daly, et al., 2010 <sup>49</sup>	Intensive communication: multidisciplinary family meeting within 5 days of admission	n = 481; before-and-after, multicenter	SICU, MICU, neuro ICU	Increased % of ICU patients receiving family meetings (19.3 to 74.3%; $p < 0.0001$ )	ICU LOS
McCormick, et al., 2010 <sup>50</sup>	Clinician education, local champions, feedback to clinicians, & order sets	n = 35 social workers (regarding 353 patient and 275 families); before-and-after, single center	Unspecified	Increased social worker discussion of: Spiritual/religious needs ( $p = 0.02$ ) Talking to and touching patient ( $p = 0.03$ ) Family disagreements about pt's care ( $p = 0.04$ ) That pt would be kept comfortable ( $p = 0.005$ )	Family satisfaction with social work Social worker satisfaction
O'Mahoney, et al., 2010 <sup>51</sup>	PC consult	n = 65; case-control; single center	MICU, SICU, cardio-thoracic ICU	Time from admission to palliative care consultation (15.5 days to 2.8 days; $p = 0.0184$ ) Lower use of ventilators ( $p = 0.047$ ), dialysis ( $p = 0.059$ ), laboratory tests ( $p = 0.004$ ), and radiological tests ( $p = 0.027$ )	Median survival time
Shelton, et al., 2010 <sup>52</sup>	Family support coordinator who acted as a liaison between medical team and patient family. The coordinator was either an APN or an ICU nurse	n = 227; before-and-after, single center	SICU	Critical Care Family Assistance Program Family Satisfaction Survey: Satisfaction with respiratory care ( $p = 0.0049$ )	ICU LOS; ICU cost Satisfaction with nursing, physician, social worker, pastoral care, or dietician
Jacobowki, et al., 2010 <sup>53</sup>	Family presence During ICU rounds	n = 227 respondents (116 pre-, 111 post-); before-and-after, single center, analyzed as treated	MICU	FS-ICU: Among families of survivors: Increased "frequency of communication with MDs" ( $p < 0.05$ ) and "support of decision making" ( $p < 0.05$ ). Decreased "satisfaction with time for decision making" ( $p < 0.05$ )	FS-ICU: Among all: "Satisfaction with care" Among families of decedents: All FS-ICU domains; Among families of survivors: all other FS-ICU domains other than two listed at left

(continued)

TABLE 1. (CONTINUED)

Study	Intervention	Study description (n=# patients, unless specified otherwise)	Population	Outcomes	
				Significant	Non-significant
Curtis, et al., 2011 <sup>54</sup>	Clinician education, local champions, feedback to clinicians, & order sets	n = 2318, prospective cluster RCT; multicenter	Unspecified	Family conference within 72 hours ( $p < 0.001$ ) Prognosis discussed during meeting ( $p = 0.04$ )	Family QOQD Nurse QOQD Family FS-ICU; ICU LOS
Villarreal, et al., 2011 <sup>55</sup>	Pre-rounds of ICU team with PC team & PC training for ICU fellows	n = 591; before-and-after, single center	MICU	% of MICU patients receiving PC consult (5% to 21%; $p < 0.001$ )	None
Sihra, et al., 2011 <sup>56</sup>	Trigger system: SICU physicians notified by PC attending physician that patient appropriate for PC consult	n = 273; before-and-after, single center	MICU, SICU	% of MICU (3.3% to 7.3%; $p < 0.001$ ) and SICU (3.3% to 5.6%; $p = 0.003$ ) patients who received PC consult	None
Penrod, et al., 2011 <sup>57</sup>	“Toolkit”—family meeting information pocket cards for ICU clinicians, brochures for family, and ELNEC training and communication skills workshops for ICU nurses	n = 415; before-and-after, multicenter	Unspecified	Increase in: Identification of surrogate ( $p < 0.05$ ) Offer of social work ( $p < 0.001$ ) Family meeting held by day 5 ( $p < 0.05$ ) Meeting was interdisciplinary ( $p < 0.01$ ) All 5 topics discussed in meeting ( $p < 0.001$ ) By day 5, interdisciplinary family meeting with all 5 topics discussed ( $p < 0.05$ ) Decrease in: Determination of advance directives ( $p < 0.01$ )	Investigation of resuscitation status Offer of spiritual support
Lamba, et al., 2012 <sup>58</sup>	PC consult	n = 193; before-and-after, single center	LT in SICU	DNR status designation (52% to 81%; $p = 0.03$ ), WOLS for decedents (35% to 68%; $p = 0.024$ )	Mortality; ICU LOS Hospital LOS

<sup>a</sup>All studies are nonrandomized, unblinded trials unless specified otherwise.

APNs, advanced practice nurses; CCFNI, Critical Care Family Needs Inventory; FS-ICU, Family Satisfaction in the ICU; GCI, global cerebral ischemia; HAD, Hospital Anxiety and Depression score; ICU, intensive care unit; IES, Impact of Event Scale; LOS, length-of-stay; LT, liver transplant recipients or candidates; MICU, medical intensive care unit; MISOF, multisystem organ failure; PC, palliative care; pts, patients; PTSD, posttraumatic stress disorder; QOQD, Quality of Death and Dying score; SICU, surgical intensive care unit; TISS, therapeutic intervention scoring system; VALUE, Validate, Acknowledge, Listen, Understand, Elicit mnemonic;<sup>55</sup> WOLS, withdrawal of life support.

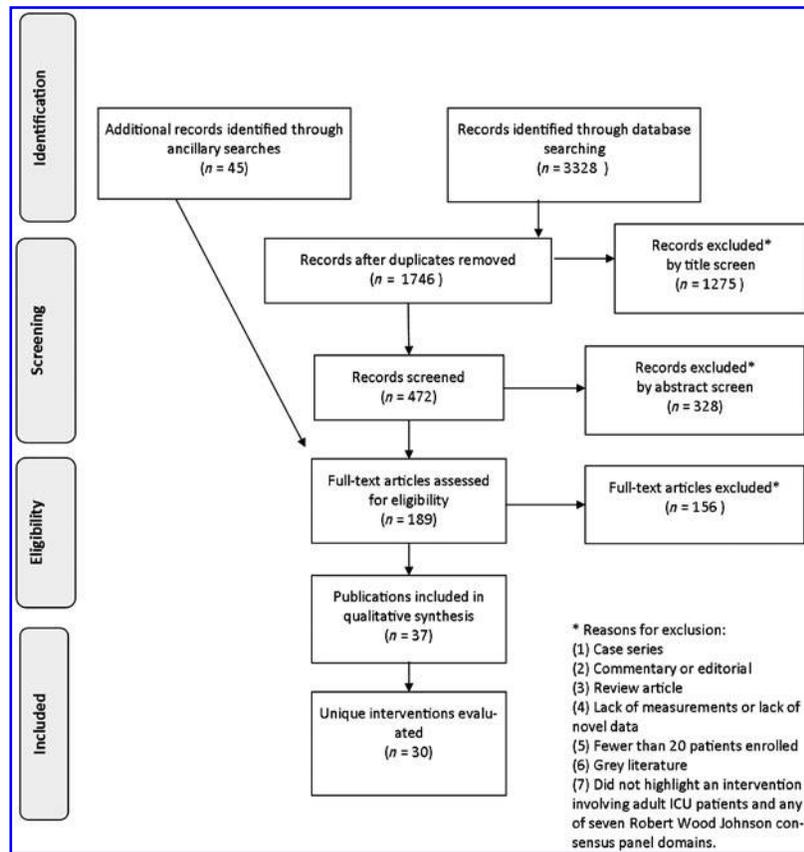


FIG. 1. Flow diagram of search strategy.

Because of wide heterogeneity in interventions evaluated and outcomes measured, we could not assess overall study quality using criteria adapted from the U.S. Preventive Services Task Force.<sup>59</sup>

**Types of studies, interventions, and ICUs**

The studies were heterogeneous both in design and in types of interventions. Five studies were prospective randomized controlled trials (RCTs), one of which was blinded. There was a single matched case-control study. The remaining studies were either pre-test/posttest or longitudinal cohort studies and were unblinded.

The types of consultative interventions included ethics consultations,<sup>26,29,35</sup> palliative care or comprehensive care consultations,<sup>22,23,36,43,46,47,51,58</sup> trigger systems indicating a patient to be appropriate for palliative care consult,<sup>33,36,48,56</sup> family coordinator involvement,<sup>52</sup> and a palliative care team member rounding with the ICU team.<sup>55</sup> Integrative interventions included intensive multidisciplinary communication with ICU team members,<sup>28,31,34,42,44,49</sup> informational brochures/booklets,<sup>24,30,42</sup> palliative care related clinician education,<sup>25,37,42,45,50,54</sup> structured communication with either an ICU nurse or social worker,<sup>27,32</sup> use of local champions,<sup>45,50,54</sup> family presence on rounds,<sup>53</sup> individual clinician feedback,<sup>45,50,54</sup> and standardized palliative care related order sets

TABLE 2. ALL INTERVENTIONS

		ICU LOS	Hospital LOS	Family satisfaction	Mortality
Total	Studies	Decreased: 13/21 = 62%	Decreased: 8/14 = 57%	Increased: 1/14 = 7% Decreased: 0/14 = 0%	Increased: 1/16 = 6% Decreased: 1/16 = 6% No change: 14/16 = 88%
	Subjects	Decreased: 5507/ 9368 = 59%	Decreased: 2477/ 5817 = 43%	Increased: 88/4927 = 2% Decreased: 0/4927 = 0%	Increased: 99/5969 = 2% Decreased: 2495/5969 = 42% No change: 3375/5969 = 57%

or symptom scoring.<sup>37,38,45,50,54</sup> Several of the interventions were comprised of multiple components.<sup>39,54,57</sup>

Two studies were completed in France,<sup>30,42</sup> whereas the remainder were completed in the United States. Three studies were completed in surgical ICUs,<sup>47,48,58</sup> with the remainder in medical ICUs or mixed med-surg ICUs.

Study quality was moderate. Many studies were small (<100 participants) and conducted at a single center. Studies generally accounted well for incomplete outcome data and did not have selective outcome reporting. However, sequence generation and allocation concealment were inadequate in many studies, and relatively few studies incorporated blinding of involved personal and/or outcome assessors. Most studies did not perform prospective power analyses, and, thus were potentially underpowered to detect differences.

### Outcome measures

Outcome measures were heterogeneous among study designs, with over 40 different validated and unvalidated metrics used (see Appendix 3). Many studies utilized multiple outcome measures. Outcomes were sometimes stratified between decedents and survivors. The four most frequently used outcome measures were ICU length of stay (LOS), hospital LOS, family satisfaction, and mortality. Because of the wide variation in study outcome measures, study comparison was challenging. However, using the four most frequent measures allowed limited but meaningful comparison among the studies.

### Study findings

The study findings were also heterogeneous. Most resulted in decreased ICU and hospital LOS without affecting mortality (see Table 2). Family satisfaction was not affected in most of the studies. Of the 21 interventions that measured ICU LOS, 13 found a decrease in ICU LOS associated with the palliative care related intervention. Of 14 interventions that measured hospital LOS, 8 found a decrease in hospital LOS associated with the intervention. Some interventions<sup>29,35</sup> decreased only decedent LOS, while others<sup>28,34</sup> decreased LOS for all ICU patients, including those who survived.

Of the 16 interventions that measured mortality, only one ( $n=99$ )<sup>26</sup> found an increase in mortality. One larger study ( $n=2495$ )<sup>34</sup> found a decrease in mortality, and the remaining studies ( $n=3375$ )<sup>22,23,28–31,35,36,42,43,47,49,51,58</sup> showed no significant change in mortality.

Of the 14 interventions that measured family satisfaction,<sup>24,27,29,30,32,39–41,44–46,50,52–54</sup> only 1<sup>46</sup> found a significant increase in overall satisfaction. Other significant findings included decreases in: nonconsensus between families and providers or between provider groups,<sup>28,47</sup> family member PTSD and anxiety,<sup>42</sup> use of ventilators,<sup>29,35,51</sup> and use of artificial nutrition and hydration.<sup>29</sup> Other significant findings included an increase in the number of family meetings<sup>42,49</sup> and the percentage of patient status changes to DNR.<sup>36</sup>

### Integrative versus consultative

Of the 18 studies that were classified as consultative 12 measured ICU LOS (see Table 3). Of those 12, 9 equating to 79% of subjects, found a decrease in ICU LOS in at least one measured subgroup. Of the 19 integrative studies, 9 measured

ICU LOS (see Table 4). Four of those 9, equating to 52% of subjects, found a decrease in ICU LOS. Similarly, of the 18 consultative studies, 9 measured hospital LOS. Six of those 9, equating to 79% of subjects, found a decrease in hospital LOS in at least one measured subgroup. Of the 18 integrative interventions, 5 measured hospital LOS; 2 of those studies, equating to 25% of subjects, found a decrease in hospital LOS.

### Discussion

Overall results suggest that despite heterogeneity, ICU-based, palliative care interventions decreased hospital and ICU LOS while changing neither hospital mortality nor family satisfaction. Interventions also improved the quality, quantity, and content of communication and decreased symptoms of distress and anxiety in family members. Interventions also decreased the use of procedures and decreased the time between admission and comfort measures only, withdrawal of life-sustaining treatments, and do-not-resuscitate orders. We found no evidence of harm in any study.

The consultative group had a higher percentage of participants with a decrease in hospital and ICU LOS than the integrative group. However, because of the heterogeneity in design and outcome measures, it is impossible to infer that one is superior to the other. Several of the studies did not measure LOS, and it is possible that these interventions would have had an impact on LOS, if it had been measured. Several of the integrative interventions did show a decrease in LOS<sup>25,28,34</sup> as well as improvement in other equally important outcomes (such as family anxiety and distress).

Two of the integrative studies<sup>30,42</sup> were completed in France, where, at the time of the intervention, ICU attending physicians did not routinely involve the family members in the decision to withdraw life support.<sup>42,60</sup> Thus, these interventions were targeted at family member anxiety and distress rather than LOS. Only one of the French studies measured ICU LOS and found no change.<sup>42</sup> Both French trials were well conducted, high-quality studies with significant findings, published in high-impact journals. Cultural differences present a challenge to the generalizability of these findings to the United States, where decision making is shared and interventions are expected to also have an effect on health care utilization and cost. However, the impact of these interventions on the well-being of family members is important.

Neither the integrative nor the consultative interventions appeared to impact family member satisfaction. The reasons for this apparent lack of effect are multifaceted. Firstly, baseline family satisfaction is relatively high (approximately 70%); only large studies would be powered to detect statistically significant changes, particularly if effect size is small. This ceiling effect could be a result of metrics that are not sensitive or calibrated to actual family satisfaction. Further, regardless of whether a patient actually receives “good” care (however that might be defined), patients and families might be invested in *believing* that they receive “good” care and reticent to criticize caregivers—if stranded in an allegorical lifeboat with few to no alternative options, patients and families may be understandably slow to question whether the boat is sound or the boat’s crew seaworthy. In addition, because patients and families might only experience one ICU,

TABLE 3. CONSULTATIVE INTERVENTIONS

<i>Study</i>	<i>Intervention</i>	<i>ICU LOS</i>	<i>Hospital LOS</i>	<i>Family satisfaction</i>	<i>Mortality</i>
Carlson, et al., 1988 <sup>22</sup>	Comprehensive support care team	NC	Decreased		NC
Field, et al., 1989 <sup>23</sup>	Comprehensive support care team	Decreased in MSOF	NC		NC
Daly, et al., 1994 <sup>24</sup>	Booklet & family meeting			NC	
Dowdy, et al., 1998 <sup>26</sup>	Ethics consult	Decreased in decedents			Increased
Schneiderman, et al., 2000 <sup>29</sup>	Ethics consult	Decreased in decedents		Unclear	NC
Ahrens, et al., 2003 <sup>31</sup>	Intensive communication	Decreased	Decreased		NC
Campbell, et al., 2003 <sup>33</sup>	PC consult	Decreased in GCI patients (not in MSOF patients)	Decreased in GCI (not in MSOF)		
Schneiderman, et al., 2003 <sup>35</sup>	Ethics consult	Decreased in decedents	Decreased in decedents		NC
Campbell, et al., 2004 <sup>36</sup>	PC consult	Decreased	Decreased		NC
Norton, et al., 2007 <sup>43</sup>	PC consult	Decreased	NC		NC
Kaufer, et al., 2008 <sup>46</sup>	PC consult—family support team consult			Increased	
Mosenthal, et al., 2008 <sup>47</sup>	PC consult	Decreased (but unclear—no <i>p</i> value)	Decreased (unclear—no <i>p</i> value)		NC
Bradley, et al., 2009 <sup>48</sup>	Triggered PC consult				
O’Mahoney, et al., 2010 <sup>51</sup>	PC consult				NC
Shelton, et al., 2010 <sup>52</sup>	Family support coordinator added	NC		Unclear	
Villareal, et al., 2011 <sup>53</sup>	PC rounding with ICU & education				
Sihra, et al., 2011 <sup>56</sup>	Triggered PC consult				
Lamba, et al., 2012 <sup>58</sup>	PC consult	NC	NC		NC
<b>Totals 18 studies</b>	<b>Studies</b>	Decreased: 9/12 = 75%	Decreased: 6/9 = 67%	Increased: 1/4 = 25%	Increased: 1/11 = 9%
	<b>Subjects (patients and/or family members)</b>	Decreased: 1892/2405 = 79%	Decreased: 1581/2005 = 79%	Increased: 88/429 = 21%	Increased: 99/2162 = 5%

they may be ill equipped to give informed appraisals that inherently involve comparison or evaluation of ICU quality. It is also possible that patients and families are educated consumers aware of all potential possibilities for ICU care and are still highly satisfied with the delivered care. Ultimately, satisfaction is a multifaceted, complex phenomenon that is difficult to meaningfully measure and interpret

One might expect that proactive palliative care in the ICU would increase mortality by potentially causing patients and/or family members to value “comfort over cure” and choose noncurative, life-limiting care options. In our experience, this preconception tends to delay consulting a palliative care professional, because the ICU provider notes he or she is not yet ready to “give up” or to “send that message” to the patient and family. However, the evidence does not support this preconception. The reviewed studies found that palliative care in the ICU was not associated with an increased likeli-

hood of patient death or with any other harm. Rather, the literature demonstrates that better palliative care in the ICU benefits patients, families, and health care systems without increasing mortality.

Although consultative interventions appeared to be more efficacious in reducing ICU and hospital LOS, each approach has benefits and drawbacks. Integrative interventions inherently involve extra duties allocated to ICU teams, who already balance multiple tasks imperative to safe and effective ICU care. Adding more, often time-intensive, tasks (such as communication exploring patient and family care goals) may be burdensome. In contrast, a consultative approach allows one provider or provider group to deliver standardized and/or evidence-based palliative care. Consultative approaches might be especially effective in ICUs with open or semi-open administration models, where integrative approaches must involve training of multiple providers of disparate disciplines and

TABLE 4. INTEGRATIVE INTERVENTIONS

<i>Study</i>	<i>Intervention</i>	<i>ICU LOS</i>	<i>Hospital LOS</i>	<i>Family satisfaction</i>	<i>Mortality</i>
Daly, et al., 1994 <sup>24</sup>	Booklet			NC	
Holloran, et al., 1995 <sup>25</sup>	Educational intervention	Decreased in decedents			
Medland, et al., 1998 <sup>27</sup>	Structured communication with ICU nurse			NC	
Lilly, et al., 2000 <sup>28</sup>	Family meetings at <72 hrs	Decreased			NC
Azoulay, et al., 2002 <sup>30</sup>	Informational brochure			NC	NC
Burns, et al., 2003 <sup>32</sup>	Structured communication with ICU social worker			NC	
Lilly, et al., 2003 <sup>34</sup>	Family meetings at <72 hrs	Decreased			Decreased
Hall, et al., 2004 <sup>37</sup>	Education, order set	NC	Decreased		
Treece, et al., 2004 <sup>38</sup>	WOLS order set	NC	NC		
Critical Care Family Assistance Program, 2005 <sup>39-41</sup>	Site-specific interventions to improve communication, environment, and educational materials			NC	
Lautrette, et al., 2007 <sup>42</sup>	VALUE format to family meetings	NC			NC
Steel, et al., 2007 <sup>44</sup>	Relative's clinic			NC	
Curtis, et al., 2008 <sup>45</sup>	Education, local champions, feedback to clinicians	Median decreased, mean increased	Decreased	NC	
Daly, et al., 2010 <sup>49</sup>	Family meetings at <5 days	NC	NC		NC
McCormick, et al., 2010 <sup>50</sup>	Education, local champions, feedback to clinicians			NC	
Jacobowski, et al., 2010 <sup>53</sup>	Family present on ICU rounds			NC	
Curtis, et al., 2011 <sup>54</sup>	Education, local champions, feedback to clinicians	NC	NC	NC	
Penrod, et al., 2011 <sup>57</sup>	Pocket cards and PC training for ICU team, brochures for family				
<b>Totals 18 studies</b>	<b>Studies</b>	Decreased: 4/9 = 44%	Decreased: 2/5 = 40%	Increased: 0/15 = 0%	Decreased: 1/5 = 20%
	<b>Subjects (patients and/or family members)</b>	Decreased: 3615/ 6963 = 51.9%	Decreased: 896/ 3812 = 23.5%	Increased: 0/5519 = 0%	Decreased: 1312/ 3807 = 34.5%

<sup>a</sup>Study had two separately analyzed components—one integrative, one consultative; study results divided for this review.

specialties. The drawback to the consultative approach is that it requires hiring, training, and paying new personnel for whom reimbursement may not cover expenses.<sup>61</sup> Thus, as ICU leaders and policy makers plan potential future interventions, the benefits and drawbacks of both approaches should be considered.

### Limitations

Threats to validity and limitations of this systematic review include that the title, abstract, and study screening were

completed by a single author (RA), and thus we cannot assess kappa or inter-reviewer reliability of study selection. In addition, the rationale for exclusion of each article was not specifically tracked and counted. As mentioned, there are also potential gaps in the search strategy because of immature MeSH terms, although the authors attempted to counteract this through the use of the ancillary search strategy. Moreover, lacking prior precedent, the definitions of consultative and integrative were formalized by study authors; their generalizability and utility are untested and unclear. Finally,

the heterogeneity of studies complicates our ability to summarize results and to use outside metrics to compare study quality.

### Directions for future research

These findings highlight multiple avenues for future research. First, the field could benefit from a definitive, well-powered, well-designed, multicenter controlled trial evaluating proactive palliative care in the ICU as compared to usual ICU care. By definition, such a trial would utilize meaningful, multifaceted outcomes; stakeholders are not likely to value an intervention that decreased ICU LOS while concurrently increasing patient suffering or family anxiety levels. As exemplified by the diversity and heterogeneity of the outcomes in previously published studies (see Appendix 3), such meaningful, multifaceted palliative care related outcomes do not currently exist, and the development and validation of such metrics is a critical area for future research.<sup>62</sup> Future ICU-based palliative care studies should also incorporate patient-centered outcomes, such as health-related quality of life and symptom scores, to ensure that interventions are reducing suffering (the core mission of palliative care) and meaningfully impacting patient and family experience. Finally, good palliative care requires that the care provided enables a patient and their family to set meaningful, and obtainable, health care related goals. Future studies could benefit through better capture of patient and family care goals and whether or not the palliative care related intervention better ensures achievement of those goals.

### Summary

This review identified 37 highly heterogeneous studies of ICU-based palliative care and palliative care related interventions. Studies were often small, single-center, of “before-and-after” study design, and underpowered. However, this data supports that palliative care in the ICU is likely to decrease ICU and/or hospital LOS, increase the quality and/or quantity of communication and consensus around patient care, and not affect mortality. No studies showed harm to patients, families, or ICU providers. In general, evidence supports that proactive ICU-based palliative care does *not hurt* and is more likely to *help* patients and families. Moreover, though many integrative interventions showed statistically significant impacts in a variety of meaningful outcomes (such as family anxiety and depression), a higher proportion of consultative interventions evidenced statistical benefit concerning ICU and hospital LOS.

### Acknowledgments

RA was salary supported throughout completion of this study by a T32 National Institutes of Health grant, a Foundation for Education and Research Mentored Research Training Grant, and a Johns Hopkins School of Medicine Clinician Scientist award.

### Author Disclosure Statement

No competing financial interests exist.

### References

1. Angus DC, Barnato AE, Linde-Zwirble WT, Weissfeld LA, Watson RS, Rickert T, Rubenfeld GD; Robert Wood Johnson Foundation ICU End-of-Life Peer Group: Use of intensive care at the end of life in the United States: An epidemiologic study. *Crit Care Med* 2004;32:638–643.
2. Teno JM, Gozalo PL, Bynum JP, Leland NE, Miller SC, Morden NE, Scupp T, Goodman DC, Mor V: Change in end-of-life care for Medicare beneficiaries: Site of death, place of care, and health care transitions in 2000, 2005, and 2009. *JAMA* 2013;309:470–477.
3. Puntillo KA, Arai S, Cohen NH, Gropper MA, Nauhaus J, Paul SM, Miaskowski C: Symptoms experienced by intensive care unit patients at high risk of dying. *Crit Care Med* 2010;38:2155–2160.
4. Nelson JE, Meier DE, Litke A, Natale DA, Siegel RE, Morrison RS: The symptom burden of chronic critical illness. *Crit Care Med* 2004;32:1527–1534.
5. Nelson JE, Puntillo KA, Pronovost PJ, Walker AS, McAdam JL, Ilaoa D, Penrod J: In their own words: Patients and families define high-quality palliative care in the intensive care unit. *Crit Care Med* 2010;38:808–818.
6. Cox CE, Carson SS, Lindquist JH, Olsen MK, Govert JA, Chelluri L; Quality of Life After Mechanical Ventilation in the Aged (QOL-MV) Investigators: Differences in one-year health outcomes and resource utilization by definition of prolonged mechanical ventilation: A prospective cohort study. *Crit Care* 2007;11:R9.
7. Cox CE, Martinu T, Sathy SJ, Clay AS, Chia J, Gray AL, Olsen MK, Govert JA, Carson SS, Tulskey JA: Expectations and outcomes of prolonged mechanical ventilation. *Crit Care Med* 2009;37:2888–2894.
8. Cox CE, Docherty SL, Brandon DH, Whaley C, Attix DA, Clay AS, Dore DV, Hough CL, White DB, Tulskey JA: Surviving critical illness: Acute respiratory distress syndrome as experienced by patients and their caregivers. *Crit Care Med* 2009;37:2702–2708.
9. Wunsch H, Guerra C, Barnato AE, Angus DC, Li G, Linde-Zwirble WT: Three-year outcomes for Medicare beneficiaries who survive intensive care. *JAMA* 2010;303:849–856.
10. Needham DM, Davidson J, Cohen H, Hopkins RO, Weinert C, Wunsch H, Zaistowski C, Bemis-Dougherty A, Berney SC, Bienvenu OJ, Brady SL, Brodsky MB, Denehy L, Elliott D, Flatley C, Harabin AL, Jones C, Louis D, Meltzer W, Muldoon SR, Palmer JB, Perme C, Robinson M, Schmidt DM, Scruth E, Spill GS, Story CP, Render M, Votto J, Harvey MA: Improving long-term outcomes after discharge from intensive care unit: Report from a stakeholders’ conference. *Crit Care Med* 2012;40:502–509.
11. Truog RD, Campbell ML, Curtis JR, Haas CE, Luce JM, Rubenfeld GD, Rushton CH, Kaufman DC: Recommendations for end-of-life care in the intensive care unit: A consensus statement by the American College of Critical Care Medicine. *Crit Care Med* 2008;36:953–963.
12. Lanken PN, Terry PB, Delisser HM, Fahy BF, Hansen-Flaschen J, Heffner JE, Levy M, Mularski RA, Osborne ML, Prendergast TJ, Rucker G, Sibbald WJ, Wilfond B, Yankaskas JR; ATS End-of-Life Care Task Force: An official American Thoracic Society clinical policy statement: Palliative care for patients with respiratory diseases and critical illnesses. *Am J Respir Crit Care Med* 2008;177:912–927.

13. Mularski RA: Defining and measuring quality palliative and end-of-life care in the intensive care unit. *Crit Care Med* 2006;34:S309–S316.
14. Mularski RA, Curtis JR, Billings JA, Burt R, Byock I, Fuhrman C, Mosenthal AC, Medina J, Ray DE, Rubenfeld GD, Schneiderman LJ, Treece PD, Truog RD, Levy MM: Proposed quality measures for palliative care in the critically ill: A consensus from the Robert Wood Johnson Foundation Critical Care Workgroup. *Crit Care Med* 2006; 34:S404–S411.
15. Clarke EB, Curtis JR, Luce JM, Levy M, Danis M, Nelson J, Solomon MZ; Robert Wood Johnson Foundation Critical Care End-Of-Life Peer Workgroup Members: Quality indicators for end-of-life care in the intensive care unit. *Crit Care Med* 2003;31:2255–2262.
16. Thompson BT, Cox PN, Antonelli M, Carlet JM, Cassell J, Hill NS, Hinds CJ, Pimentel JM, Reinhart K, Thijs LG: Challenges in end-of-life care in the ICU: Statement of the 5th International Consensus Conference in Critical Care. Brussels, Belgium, April 2003. Executive Summary. *Crit Care Med* 2004;32:1781–1784.
17. Carlet J, Thijs LG, Antonelli M, Cassell J, Cox P, Hill N, Hinds C, Pimentel JM, Reinhart K, Thompson BT: Challenges in end-of-life care in the ICU: Statement of the 5th International Consensus Conference in Critical Care. Brussels, Belgium, April 2003. *Intensive Care Med* 2004; 30:770–784.
18. Scheunemann LP, McDevitt M, Carson SS, Hanson LC: Randomized, controlled trials of interventions to improve communication in intensive care: A systematic review. *Chest* 2011;139:543–554.
19. Nelson JE, Bassett R, Boss RD, Brasel KJ, Campbell ML, Cortez TB, Curtis JR, Lustbader DR, Mulkerin C, Puntillo KA, Ray DE, Weissman DE; Improve Palliative Care in the ICU Project: Models for structuring a clinical initiative to enhance palliative care in the intensive care unit: A report from the IPAL-ICU Project (Improving Palliative Care in the ICU). *Crit Care Med* 2010;38:1765–1772.
20. Agency for Healthcare Research and Quality: *Methods Guide for Effectiveness and Comparative Effectiveness Reviews*. AHRQ publication no. 10(11)–EHC063-EF. Rockville, MD: Agency for Healthcare Research and Quality, 2011.
21. Guyah GH, Oxman AD, Vist GE, Kunz R, Falck-Ytter Y, Alonso-Coello P, Schunemann HJ for GRADE working group. GRADE: an emerging consensus on rating quality of evidence and strength of recommendation. *BMJ* 2008; 336:924–926.
22. Carlson RW, Devich L, Frank RR: Development of a comprehensive supportive care team for the hopelessly ill on a university hospital medical service. *JAMA* 1988;259: 378–383.
23. Field BE, Devich LE, Carlson RW: Impact of a comprehensive supportive care team on management of hopelessly ill patients with multiple organ failure. *Chest* 1989;96:353–356.
24. Daly K, Kleinpell RM, Lawinger S, Casey G: The effect of two nursing interventions on families of ICU patients. *Clin Nurs Res* 1994;3:414–422.
25. Holloran SD, Starkey GW, Burke PA, Steele G, Jr, Forse RA: An educational intervention in the surgical intensive care unit to improve ethical decisions. *Surgery* 1995;118: 294–298; discussion 298–299.
26. Dowdy MD, Robertson C, Bander JA: A study of proactive ethics consultation for critically and terminally ill patients with extended lengths of stay. *Crit Care Med* 1998;26:252–259.
27. Medland JJ, Ferrans CE: Effectiveness of a structured communication program for family members of patients in an ICU. *Am J Crit Care* 1998;7:24–29.
28. Lilly CM, De Meo DL, Sonna LA, Haley KJ, Massaro AF, Wallace RF, Cody S: An intensive communication intervention for the critically ill. *Am J Med* 2000;109:469–475.
29. Schneiderman LJ, Gilmer T, Teetzel HD: Impact of ethics consultations in the intensive care setting: A randomized, controlled trial. *Crit Care Med* 2000;28:3920–3924.
30. Azoulay E, Pochard F, Chevret S, Jourdain M, Bronstain C, Wernet A, Cattaneo I, Annane D, Brun F, Bollaert PE, Zahar JR, Goldgran-Toledano D, Adrie C, Joly LM, Tayoro J, Desmettre T, Pigne E, Parrot A, Sanchez O, Poisson C, Le Gall JR, Schlemmer B, Lemaire F; the French FAM-IREA Group: Impact of a family information leaflet on effectiveness of information provided to family members of intensive care unit patients: A multicenter, prospective, randomized, controlled trial. *Am J Respir Crit Care Med* 2002;165:438–442.
31. Ahrens T, Yancey V, Kollef M: Improving family communications at the end of life: Implications for length of stay in the intensive care unit and resource use. *Am J Crit Care* 2003;12:317–323.
32. Burns JP, Mello MM, Studdert DM, Puopolo AL, Truog RD, Brennan TA: Results of a clinical trial on care improvement for the critically ill. *Crit Care Med* 2003;31: 2107–2117.
33. Campbell ML, Guzman JA: Impact of a proactive approach to improve end-of-life care in a medical ICU. *Chest* 2003; 123:266–271.
34. Lilly CM, Sonna LA, Haley KJ, Massaro AF: Intensive communication: Four-year follow-up from a clinical practice study. *Crit Care Med* 2003;31:S394–S399.
35. Schneiderman LJ, Gilmer T, Teetzel HD, Dugan DO, Blustein J, Cranford R, Briggs KB, Komatus GI, Goodman-Crews P, Cohn F, Young EWD: Effect of ethics consultations on nonbeneficial life-sustaining treatments in the intensive care setting: A randomized controlled trial. *JAMA* 2003;290:1166–1172.
36. Campbell ML, Guzman JA: A proactive approach to improve end-of-life care in a medical intensive care unit for patients with terminal dementia. *Crit Care Med* 2004;32: 1839–1843.
37. Hall RI, Rocker GM, Murray D: Simple changes can improve conduct of end-of-life care in the intensive care unit. *Can J Anaesth* 2004;51:631–636.
38. Treece PD, Engelberg RA, Crowley L, Chan JD, Rubenfeld GD, Steinberg KP, Curtis JR: Evaluation of a standardized order form for the withdrawal of life support in the intensive care unit. *Crit Care Med* 2004;32:1141–1148.
39. Lederer MA, Goode T, Dowling J: Origins and development: The Critical Care Family Assistance Program. *Chest* 2005;128:S65–S75.
40. Dowling J, Wang B: Impact on family satisfaction: The Critical Care Family Assistance Program. *Chest* 2005;128: S76–S80.
41. Dowling J, Vender J, Guilianelli S, Wang B: A model of family-centered care and satisfaction predictors: The Critical Care Family Assistance Program. *Chest* 2005;128: S81–S92.
42. Lautrette A, Darmon M, Megarbane B, Joly LM, Chevret S, Adrie C, Barnoud D, Bleichner G, Bruel C, Choukroun G,

- Curtis JR, Fieux F, Galliot R, Garrouste-Orgeas M, Georges H, Goldgran-Toledano D, Jourdain M, Loubert G, Reignier J, Saidi F, Souweine B, Vincent F, Barnes NK, Pochard F, Schlemmer B, Azoulay E: A communication strategy and brochure for relatives of patients dying in the ICU. *N Engl J Med* 2007;356:469–478.
43. Norton SA, Hogan LA, Holloway RG, Temkin-Greener H, Buckley MJ, Quill TE: Proactive palliative care in the medical intensive care unit: Effects on length of stay for selected high-risk patients. *Crit Care Med* 2007;35:1530–1535.
  44. Steel A, Underwood C, Notley C, Blunt M: The impact of offering a relative's clinic on the satisfaction of the next-of-kin of critical care patients: A prospective time-interrupted trial. *Intensive Crit Care Nurs* 2008;24:122–129.
  45. Curtis JR, Treece PD, Nielsen EL, Downey L, Shannon SE, Braungardt T, Owens D, Steinberg KP, Engelberg RA: Integrating palliative and critical care: Evaluation of a quality-improvement intervention. *Am J Respir Crit Care Med* 2008;178:269–275.
  46. Kaufer M, Murphy P, Barker K, Mosenthal A: Family satisfaction following the death of a loved one in an inner city MICU. *Am J Hosp Palliat Care* 2008;25:318–325.
  47. Mosenthal AC, Murphy PA, Barker LK, Lavery R, Retano A, Livingston DH: Changing the culture around end-of-life care in the trauma intensive care unit. *J Trauma* 2008;64:1587–1593.
  48. Bradley C, Weaver J, Brasel K: Addressing access to palliative care services in the surgical intensive care unit. *Surgery (USA)* 2010;147:871–877.
  49. Daly BJ, Douglas SL, O'Toole E, Gordon NH, Hejal R, Peerless J, Rowbottom J, Garland A, Lilly C, Wiencek C, Hickman R: Effectiveness trial of an intensive communication structure for families of long-stay ICU patients. *Chest* 2010;138:1340–1348.
  50. McCormick AJ, Curtis JR, Stowell-Weiss P, Toms C, Engelberg R: Improving social work in intensive care unit palliative care: Results of a quality improvement intervention. *J Palliat Med* 2010;13:297–304.
  51. O'Mahony S, McHenry J, Blank AE, Snow D, Karakas SE, Santora G, Selwyn P, Kvetan V: Preliminary report of the integration of a palliative care team into an intensive care unit. *Palliat Med* 2010;24:154–165.
  52. Shelton W, Moore CD, Socaris S, Gao J, Dowling J: The effect of a family support intervention on family satisfaction, length-of-stay, and cost of care in the intensive care unit. *Crit Care Med* 2010;38:1315–1320.
  53. Jacobowski NL, Girard TD, Mulder JA, Ely EW: Communication in critical care: Family rounds in the intensive care unit. *Am J Crit Care* 2010;19:421–430.
  54. Curtis JR, Nielsen EL, Treece PD, Downey L, Dotolo D, Shannon SE, Back AL, Rubenfeld GD, Engelberg RA: Effect of a quality-improvement intervention on end-of-life care in the intensive care unit: A randomized trial. *Am J Respir Crit Care Med* 2011;183:348–355.
  55. Villarreal D, Restrepo MI, Healy J, Howard B, Tidwell J, Ross J, Hartroft S, Jawad M, Sanchez-Reilly S, Reed K, Espinoza SE: A model for increasing palliative care in the intensive care unit: Enhancing interprofessional consultation rates and communication. *J Pain Symptom Manage* 2011;42:676–679.
  56. Sihra L, Harris M, O'Reardon C: Using the improving palliative care in the intensive care unit (IPAL-ICU) project to promote palliative care consultation. *J Pain Symptom Manage* 2011;42:672–675.
  57. Penrod JD, Luhrs CA, Livote EE, Cortez TB, Kwak J: Implementation and evaluation of a network-based pilot program to improve palliative care in the intensive care unit. *J Pain Symptom Manage* 2011;42:668–671.
  58. Lamba S, Murphy P, McVicker S, Smith JH, Mosenthal AC: Changing end-of-life care practice for liver transplant service patients: Structured palliative care intervention in the surgical intensive care unit. *J Pain Symptom Manage* 2012;44(4):508–519.
  59. Harris RP, Helfand M, Woolf SH, et al.: Current methods of the US Preventive Services Task Force: A review of the process. *Am J Prev Med* 2001;20:21–35.
  60. Azoulay E, Pochard F, Chevret S, et al.: Half the family members of intensive care unit patients do not want to share in the decision-making process: A study in 78 French intensive care units. *Crit Care Med* 2004;32:1832–1838.
  61. Lustbader DR, Nelson JE, Weissman DE, Hays RM, Mosenthal AC, Mulkerin C, Puntillo KA, Ray DE, Bassett R, Boss RD, Brasel KJ, Campbell ML, Cortez TB, Curtis JR; IPAL-ICU Project: Physician reimbursement for critical care services integrating palliative care for patients who are critically ill. *Chest* 2012;141:787–792.
  62. Aslakson RA, Bridges JFPB: Assessing the impact of palliative care in the intensive care unit through the lens of patient-centered outcomes research. *Curr Opin Crit Care* 2013;19:504–510.

Address correspondence to:  
*Rebecca Aslakson, MD, PhD*  
*Department of Anesthesiology*  
*and Critical Care Medicine*  
*The Johns Hopkins Hospital*  
*600 North Wolfe Street, Meyer 297A*  
*Baltimore, MD 21287-7295*

*E-mail: raslaks1@jhmi.edu*

## APPENDIX 1

Search strategies for:

**MEDLINE:**

("palliative care"[MeSH Terms] OR ("palliative"[All Fields] AND "care"[All Fields]) OR "palliative care"[All Fields] OR palliation[All Fields] OR ("palliative care"[MeSH Terms] OR ("palliative"[All Fields] AND "care"[All Fields]) OR "palliative care"[All Fields] OR ("palliative"[All Fields] AND "medicine"[All Fields]) OR "palliative medicine"[All Fields])) AND (("intensive care units"[MeSH Terms] OR ("intensive"[All Fields] AND "care"[All Fields] AND "units"[All Fields]) OR "intensive care units"[All Fields] OR ("intensive"[All Fields] AND "care"[All Fields] AND "unit"[All Fields]) OR "intensive care unit"[All Fields]) OR "respiratory care unit"[All Fields] OR "respiratory care units"[All Fields] OR "coronary care units"[All Fields] OR "coronary care unit"[All Fields] OR "burn unit"[All Fields] OR "burn units"[All Fields] OR "recovery room"[All Fields] OR "recovery rooms"[All Fields])

**Embase:**

'intensive care unit'/exp OR 'intensive care unit' OR 'intensive care units'/exp OR 'intensive care units' OR 'close attention unit'/exp OR 'close attention unit' OR 'intensive care department'/exp OR 'intensive care department' OR 'close attention units' OR 'intensive care departments' OR 'respiratory care unit'/exp OR 'respiratory care unit' OR 'respiratory care units'/exp OR 'respiratory care units' OR 'special care unit'/exp OR 'special care unit' OR 'special care units' AND 'palliative therapy'/exp OR 'palliative therapy' OR 'palliative care'/exp OR 'palliative care' OR 'palliative medicine'/exp OR 'palliative medicine' OR

'palliation'/exp OR 'palliation' OR 'palliative treatment'/exp OR 'palliative treatment' OR 'palliative surgery'/exp OR 'palliative surgery' OR 'symptomatic treatment'/exp OR 'symptomatic treatment'

**CINAHL:**

((MH "Palliative Care") OR "palliative care" OR "palliation" OR "palliative medicine" OR "palliative nursing" OR "palliative therapy" OR "palliative treatment") AND (((MH "Intensive Care Units") or (MH "Coronary Care Units") or (MH "Oncology Care Units") or (MH "Post Anesthesia Care Units")) or "intensive care unit" or "intensive care units" OR "coronary care units" OR "coronary care unit" OR "oncology care units" OR "oncology care unit" OR "post anesthesia care unit" OR "post anesthesia care units")

**Cochrane:**

((palliation) or (palliative therapy) or (palliative care) or (palliative medicine) or (palliative treatment) or (palliative surgery)) AND ((intensive care unit) or (intensive care units) or (close attention unit) or (close attention units) or (intensive care department) or (intensive care departments) or (respiratory care unit) or (respiratory care units) or (special care unit) or (special care units))

**Web of Science:**

(Topic=(palliation) OR Topic=(palliative care) OR Topic=(palliative medicine) OR Topic=(palliative therapy) OR Topic=(palliative surgery) OR Topic=(palliative treatment) ) AND (Topic=(intensive care unit) OR Topic=(close attention unit) OR Topic=(intensive care department) OR Topic=(respiratory care unit) OR Topic=(special care unit) )

## APPENDIX 2

List of researchers and thought leaders whose publications were reviewed via Web of Science:

Azoulay, Elie  
 Curtis, J Randall  
 Engelberg, Ruth A  
 Levy, Mitchell  
 Mularski, Robert  
 Nelson, Judith  
 Prendergast, Thomas J  
 Puntillo, Kathleen  
 Rubinfeld, Gordon D  
 Sprung, Charles  
 Truog, Robert D  
 Wall, Richard  
 Weissman, David  
 White, Douglas

APPENDIX 3. OUTCOMES MEASURE USED IN ICU-BASED PALLIATIVE CARE RELATED INTERVENTIONS

<i>System-related</i>	<i>Content-related</i>
In-hospital mortality Frequency of CPR at time of patient death Frequency of ethics-related discussions Tracheostomy rates % of patients with DNR orders % of patients with WOLS orders % of patients receiving aggressive treatments	ICU length of stay Hospital length-of-stay Cost (fixed and variable) Content of communication Involvement of doctors in WOLS discussions Participation of social workers Participation of chaplains Participation of care coordinators Time between WOLS and patient death Time between admission and DNR orders Time between admission and CMO orders Days receiving artificial ventilation Therapeutic Intervention Scoring System score Days receiving dialysis Time that family speak during a meeting # of laboratory draws Benzodiazepine administration Narcotic administration Discussions of goals of care by doctor on rounds
<i>Clinician-related</i>	<i>Family-related</i>
Health-care provider satisfaction Social worker satisfaction concerning family needs Nurse QODD score	Quality of communication Critical Care Family Satisfaction Survey Family satisfaction – non-validated metrics Number of calls to family at home Consensus between family and clinician team Critical Care Family Needs Index score Family QODD score Family Satisfaction with Care Questionnaire Family Hospital Anxiety and Distress Scale score Family Impact of Even score Family Satisfaction in the ICU score Family feelings concerning being accepted by staff Social worker reported family activities Family satisfaction with social work Family satisfaction with decision making Critical Care Family Satisfaction Survey Family satisfaction regarding discussions of diagnosis, prognosis, and treatments